

REMARKS

The Specification has been amended to correct a typographical error which was noted during preparation of the Information Disclosure Statement discussed below. Claims 1-6 are pending. No claim amendments are presented at this time. Rather, reconsideration of the application is requested in view of the remarks set forth below.

Information Disclosure Statement

As an initial matter, the Office Action notes that the references listed in the specification have not all been properly cited in an Information Disclosure Statement (IDS). Accordingly, a Supplemental IDS is being filed concurrently herewith and proper consideration of each of the references is requested.

Claim rejections under 35 USC §103(a)

Claims 1-6 stand rejected under 35 USC §103(a) over Davis et al. (US 5,756,838, referred to as US '838, and indicated as being equivalent to WO 95 22405) in view of Ishizaki et al. (US 5,274,146, referred to as US '146, and indicated as being equivalent to EP 0544455 and JP 5170780).

The rejection is traversed. The cited references, even in the stated combination, do not teach or suggest the features of the present invention and are insufficient to sustain the rejection.

For instance, the structure of the ligand of the catalyst used in SAP of US '838 differs from that of the ligand of the catalyst used in the present invention.

More particularly, the ligand used in US '838 is a ligand where 4 phenyl groups binding to phosphorous introduce 1 sulfonic acid group, respectively (see Figure 2 of US '838). In contrast, however, the ligand used in the present invention is a ligand where 2 naphthyl groups of a binaphthyl structure introduce 1 sulfonic acid group, respectively (see formula (4) of claim 1).

Since the structures of the ligands differ as noted above, the resulting properties of the ligands differ, and their respective methods of use differ as well.

Additionally, referring to Example 9 of US '838, a catalyst is used in the form of SAP. SAP is a catalyst immobilized to a silica carrier by H₂O molecules and the immobilized catalyst (SAP) is insoluble to the reaction solvent. It is known that H₂O molecules adsorbed to silica's surface are highly immobilized. Therefore, the catalyst (SAP) used in US '838 is a solid catalyst which reacts as a heterogeneous catalyst in a homogeneous reaction solution.

In the present invention, the catalyst is soluble to the reaction solvent. Therefore, the ligand of the present invention reacts as a homogeneous catalyst and is highly efficient.

Moreover, the catalyst used in Example 9 of US '838 is a solid catalyst; therefore, in order to recover and recycle, filtration is necessary (see column 18, line 47-54 of US '838). Filtration is very inconvenient when a continuous process is carried out. Further, a solid catalyst imposes a heavy environmental burden because eventually, the carrier must be disposed of as waste product. Therefore, the method described in Example 9 is quite disadvantageous.

In contrast to the cited art, the ligand used in the present invention is dissolved in the reaction solution during the reaction, it can be easily separated as an aqueous solution after the reaction, and can be directly recycled. The inconvenient step of filtration is unnecessary, and a continuous process can be suitably carried out. The carrier is not disposed of as waste product, so it does not impose a heavy environmental burden. This alone is a very notable advantage of the method of the present invention.

Since the method of the Example 9 of US '838 and the method of the present invention have the above-mentioned differences, the resulting optical purity varies greatly.

For instance, the optical purity for Example 9 of US '838 is as low as 28.7-77.0%ee. Entry 1 of Table 8 indicates that in cases where SAP is used, unless the support condition is not constantly adjusted, the optical purity becomes very low.

Once again, in contrast to the art cited, the optical purity in the present invention is high as, for example, 92.2-92.5%ee in Table 1 (Example 2), 93.2-94.0%ee in Table 2 (Example 6), and 92.1-93.1%ee in Table 3 (Examples 7-10). In view of that, there is no need to make such an adjustment in order to use the catalyst.

One skilled in the art understands that the improvement of optical purity is very important and is also very difficult. As for synthesis of an optical isomer, a method where optical purity can be improved more than 10%ee is an excellent method, and very difficult to develop.

Accordingly, the present invention differs from the invention disclosed in Example 9 of US '838 in terms of structure, and has an surprisingly excellent effect (further rebutting any *prima facie* case of obviousness which may be contended). The present invention is not rendered obvious by the disclosure of US '838, even when combined with the other references applied.

First, the catalyst used in Example 9 of US '838 (SAP) is a ligand supported by a solid carrier. Therefore, to use the catalyst from which the solid carrier is removed means to destroy the catalyst (SAP).

US '146 and US '861 are deficient and cannot remedy the deficiencies of US '838. For instance, US '146 and US '861 merely disclose a hydrogenation reaction of ethyl acetoacetate (Application Example 1), a hydrogenation reaction of

acetophenonebenzylimine (Application Example 2) and a hydrogenation reaction of aminomethyl phenyl ketone (Application Example 3). They do not teach or suggest the synthesis of an optical isomer by hydrogenation reaction of unsaturated carboxylic acid.

One skilled in the art appreciates that it is extremely difficult to predict what kind of catalyst works on what kind of substrate, in what yield, in what reaction, etc.

One skilled in the art would not even be motivated to combine the cited references, nor could he/she predict that the catalyst used in the reactions of US '146 and US '861 would be suitable for synthesis of an optical isomer by a hydrogenation reaction of unsaturated carboxylic acid, nor could he/she predict that such method would offer the advantages and high optical purity of the present invention.

Accordingly, the rejection under §103(a) is properly withdrawn. For instance, it is well-known that to establish a *prima facie* case of obviousness, three basic criteria must be met: (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) there must be a reasonable expectation of success; and (3) the prior art reference(s) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143.

There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the cited references to make the claimed invention, nor is there a reasonable expectation of success. Accordingly, reconsideration and withdrawal of the rejection are requested.

In view of the above remarks, Applicant believes the pending application is in condition for allowance.